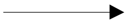
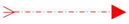
Directory Integrator

Legend for Diagrams

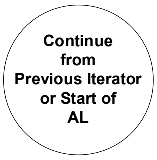
Hook Flow diagrams



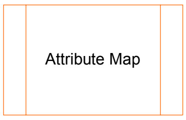
Black arrows indicate normal flow.



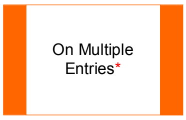
Red arrows show error/exception flow. Errors can occur both in scripted flow components, as well as in Integrator operations.



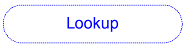
The Flow Endpoint symbol represents the start or end of the flow for a flow diagram. The text contained in the symbol provides more information about system state and behavior at this point.



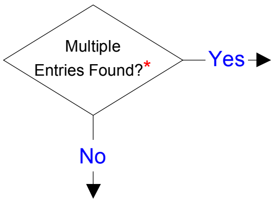
These boxes represent scripted flow components, and are used for both Attribute Maps and Hooks. Note that if a Hook is enabled, then control is passed to the script in the Hook. If a Hook is not enabled, then the flow continues past the Hook without executing it.



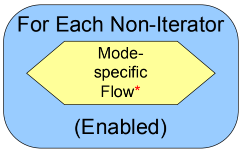
A few Hooks are *mandatory* and must be enabled, although they do not need to actually contain any script. If a mandatory Hook is not enabled and the flow reaches this point, then this is considered an **error**, and control faults out to error handling.



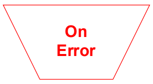
This box represents an Integrator operation (these are available as functions in the component Interface object. Note that Integrator operations may also result in error flows.



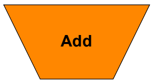
Decision components represent logical branches in component flow execution, depending on state information at this point.



The yellow trapezoid describe flow which is detailed elsewhere (i.e. on another page in this document. The optional rounded blue box includes the



The Continuation symbol indicates that the flow is continued on another page that is common for one or more modes. The page being referenced will appear in a label below this symbol.



This is a Continuation symbol that is used when the referenced page is still part of the same component mode flow. The page being referenced will appear in a label below this symbol.

AssemblyLine Flow

Hook Flow diagrams

IBM Directory Integrator

*Flow References

These yellow trapezoids represent flows found in the AssemblyLine components.

Initialization Flows are found on the pages entitled **Initialization & Close Flows**

Iterator Flow is described on the page for **Iterator** Mode flow.

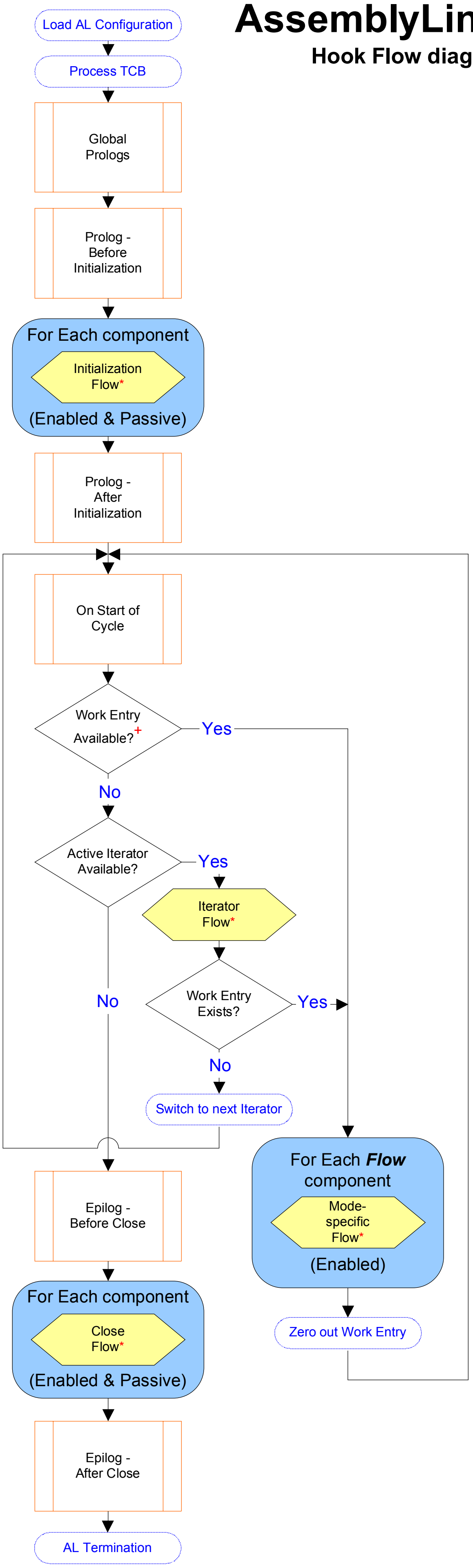
Mode-specific Flow can be found on the page(s) for that component Mode.

+Work Entry Available

This test checks to see if there is an **Entry** object which is to be used as **work** for the new cycle.

This Entry can be provided in a number of ways:

o an **Initial Work Entry** (IWE)
o via a call to **task.setWork()**
o using **system.restartEntry()**



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Connector Initialization Flow

Hook Flow diagrams

Available Objects

The **work** object is not available in Initialization Hooks (unless it is provided as an **Initial Work Entry (IWE).**

As always, if an **Error Hook** is enabled, the error flow continues and does not go to the **Error Flow**.

Error Handling

Please note that if the **Prolog On Error** Hook is enabled, then control is passed to back to the AssemblyLine flow; Otherwise, the AssemblyLine **aborts**.

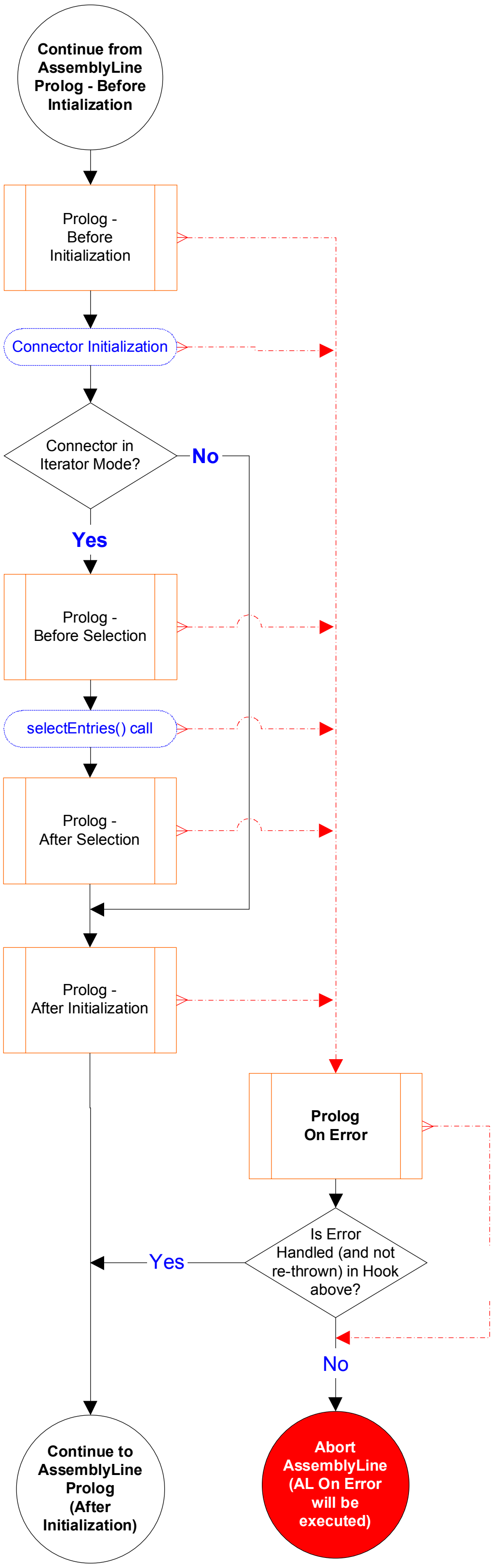
The error condition can be passed on to next On Error Hook (i.e. to the AssemblyLine Error Hook) by re-throwing the exception:

throw error.getObject("exception");

Furthermore, if an error occurs in an **On Error** Hook, then the AssemblyLine will also **abort**.

The **error** object (of type **Entry**) is available throughout an AssemblyLine, and provides information about the error situation through its attributes: **status**, **exception**, **class**, **message**, **operation** and **connectorname**.

The **status** attribute will have the string value "**OK**" until an error situation arises, at which time it is assigned the value "**fail**" and the other attributes are added to **error**.


Continue from AssemblyLine Prolog - Before Intialization
Prolog - Before Initialization
Connector Initialization
Connector in Iterator Mode?
No
Yes
Prolog - Before Selection
selectEntries() call
Prolog - After Selection
Prolog - After Initialization
Prolog On Error
Is Error Handled (and not re-thrown) in Hook above?
Yes
No
Continue to AssemblyLine Prolog (After Initialization)
Abort AssemblyLine (AL On Error will be executed)

Available temporary script variables

error

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Connector Close Flow

Hook Flow diagrams

Available temporary script variables

error

Available Objects

Close Hooks will have access to the last **work** Entry processed by the AssemblyLine

As always, if an **Error Hook** is enabled, the error flow continues and does not go to the **Error Flow**.

Error Handling

Please note that if the **Prolog On Error** Hook is enabled, then control is passed to back to the AssemblyLine flow; Otherwise, the AssemblyLine **aborts**.

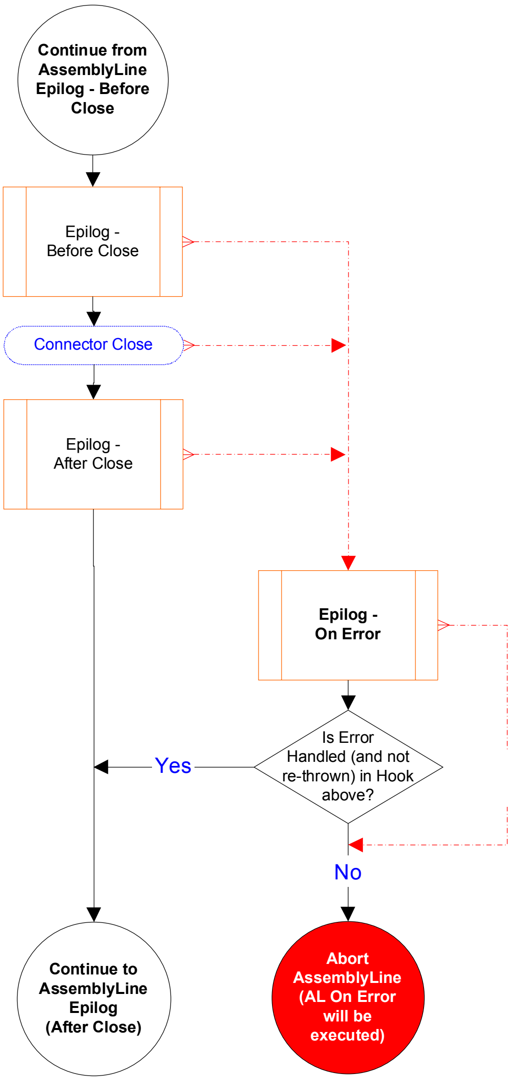
The error condition can be passed on to next On Error Hook (i.e. to the AssemblyLine Error Hook) by re-throwing the exception:

throw error.getObject("exception");

Furthermore, if an error occurs in an **On Error** Hook, then the AssemblyLine will also **abort**.

The **error** object (of type **Entry**) is available throughout an AssemblyLine, and provides information about the error situation through its attributes: **status**, **exception**, **class**, **message**, **operation** and **connectorname**.

The **status** attribute will have the string value "**OK**" until an error situation arises, at which time it is assigned the value "**fail**" and the other attributes are added to **error**.



Continue from AssemblyLine Epilog - Before Close
Epilog - Before Close
Connector Close
Epilog - After Close
Epilog - On Error
Is Error Handled (and not re-thrown) in Hook above?
Yes
No
Continue to AssemblyLine Epilog (After Close)
Abort AssemblyLine (AL On Error will be executed)

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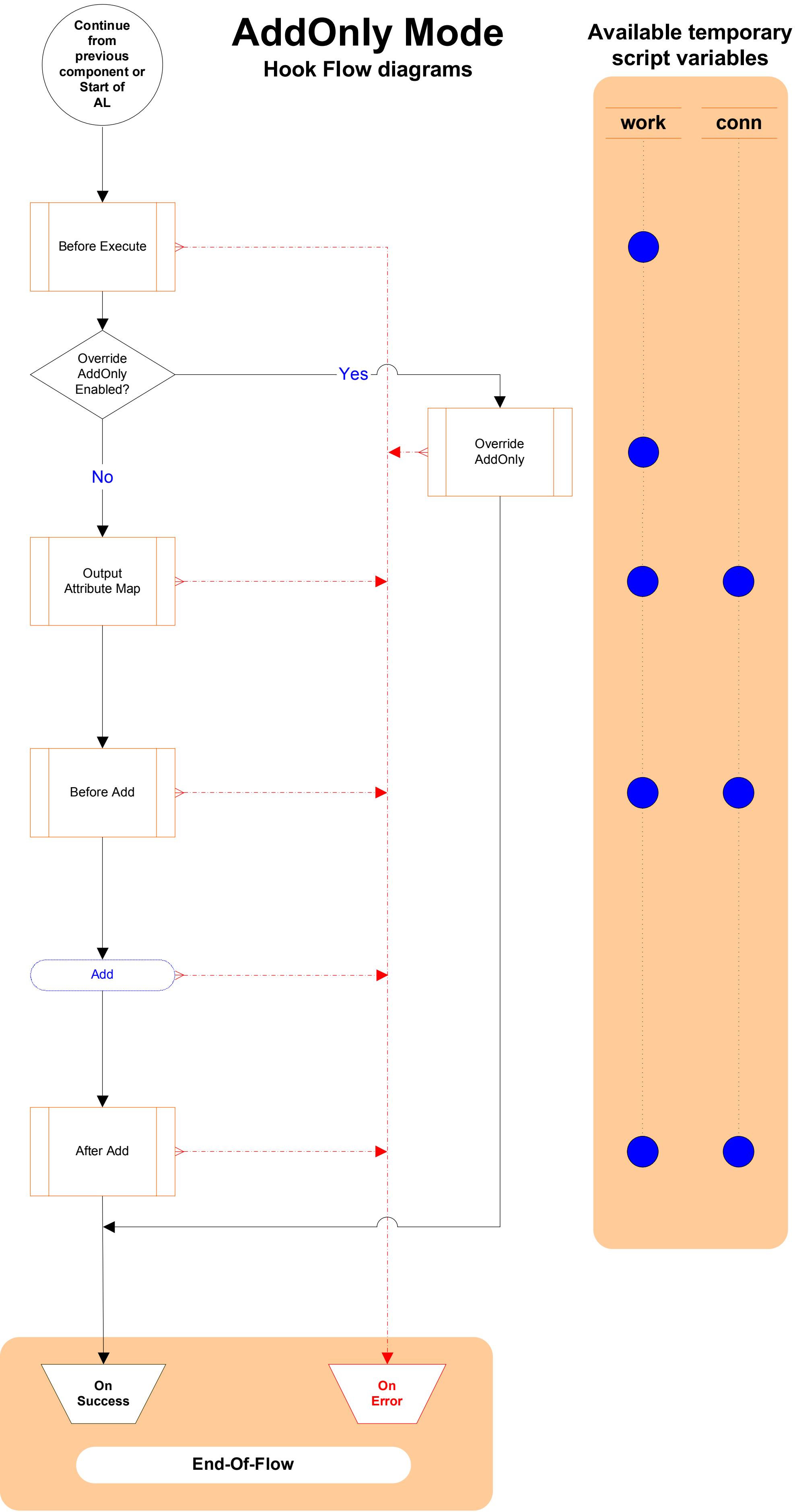
AddOnly Mode

Hook Flow diagrams

Available Objects

As always, **work** gives you access to the attributes that are currently in the AssemblyLine.

The information stored in the **conn** object is written to the data source by the **Add** operation.



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Call/Reply Mode

Hook Flow diagrams

Available Objects

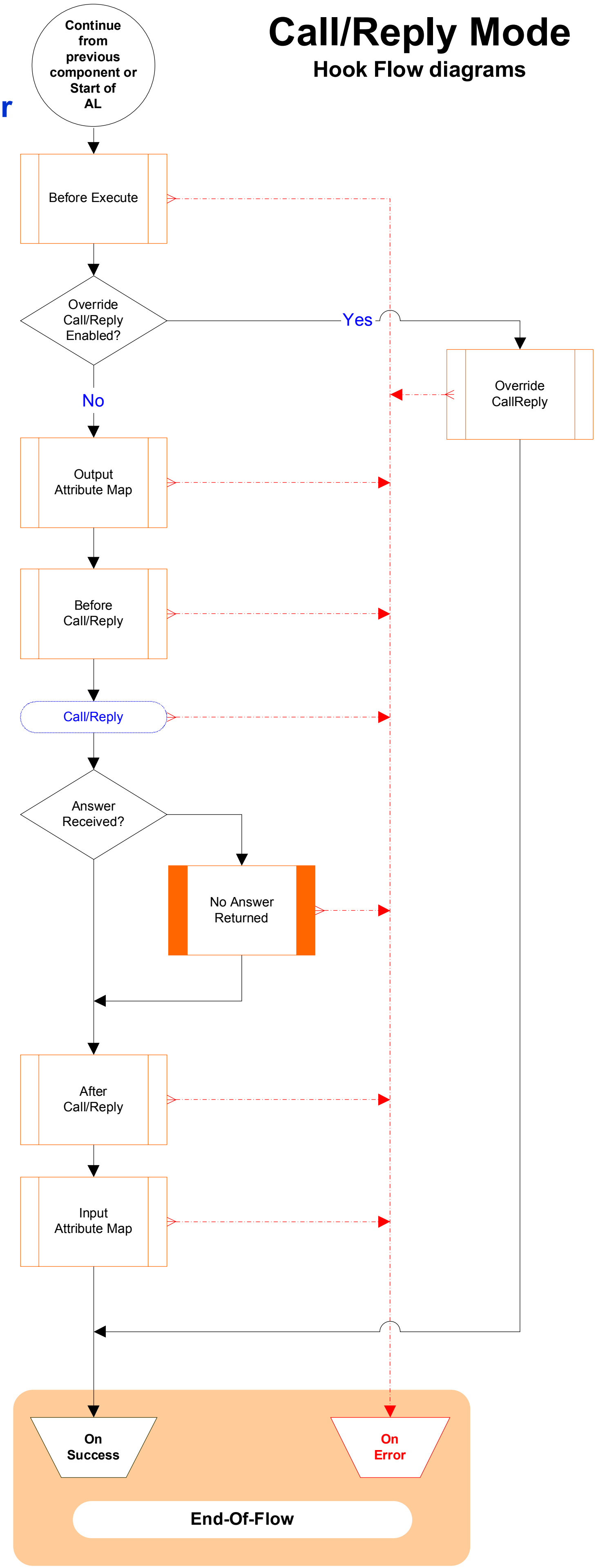
As always, **work** gives you access to the attributes that are currently in the AssemblyLine.

*The information stored in the **conn** object is slightly different in this mode.

It is important to note that the **conn** object serves two different purposes in **Call/Reply** mode:

1) Storing the call attributes/parameters defined in the **Output Attribute Map** to be transmitted by the Call/Reply operation,

2) Receiving return attributes/parameters that will be accessed by the **Input Attribute Map** after the Call/Reply operation



Continue from previous component or Start of AL

Before Execute

Override Call/Reply Enabled?

Yes

Override CallReply

No

Output Attribute Map

Before Call/Reply

Call/Reply

Answer Received?

No Answer Returned

After Call/Reply

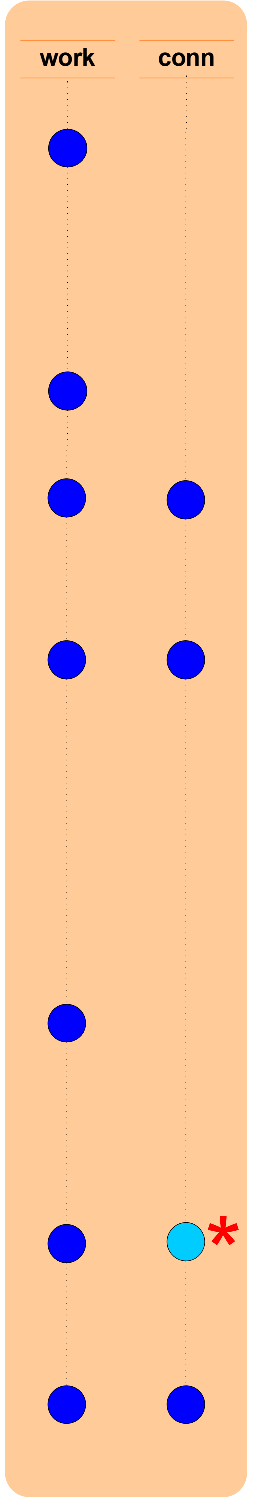
Input Attribute Map

On Success

On Error

End-Of-Flow

Available temporary script variables



work

conn

*

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Delete Mode 1/2

Hook Flow diagrams

Available Objects

As always, **work** gives you access to the attributes that are currently in the AssemblyLine.

After the **Build Link Criteria** operation, there is a script object called **search** available which gives you access to this information (i.e. for use in the Override Hook).

The record/entry matching the **Link Criteria** (and that is about to be deleted) is available for scripting as the **conn** object, and Attribute Mapping is carried out to allow your AssemblyLine to use Attributes from the Entry which is to be deleted.

**On Multiple Entries*

If more than one record/entry is found that matches the Link Criteria then the On Multiple Entries Hook must also be **enabled**, or this is treated as an **error**.

You can access the set of records/entries found by using either of these two Connector functions:

getFirstDuplicateEntry()
or
getNextDuplicateEntry()

Each of these functions returns an **Entry** object that can be used to call a Connector Interface's data access methods (.update(), delete(), etc.).

If you wish to proceed with the delete flow/operation, then you must set the current Entry with the following Connector function:

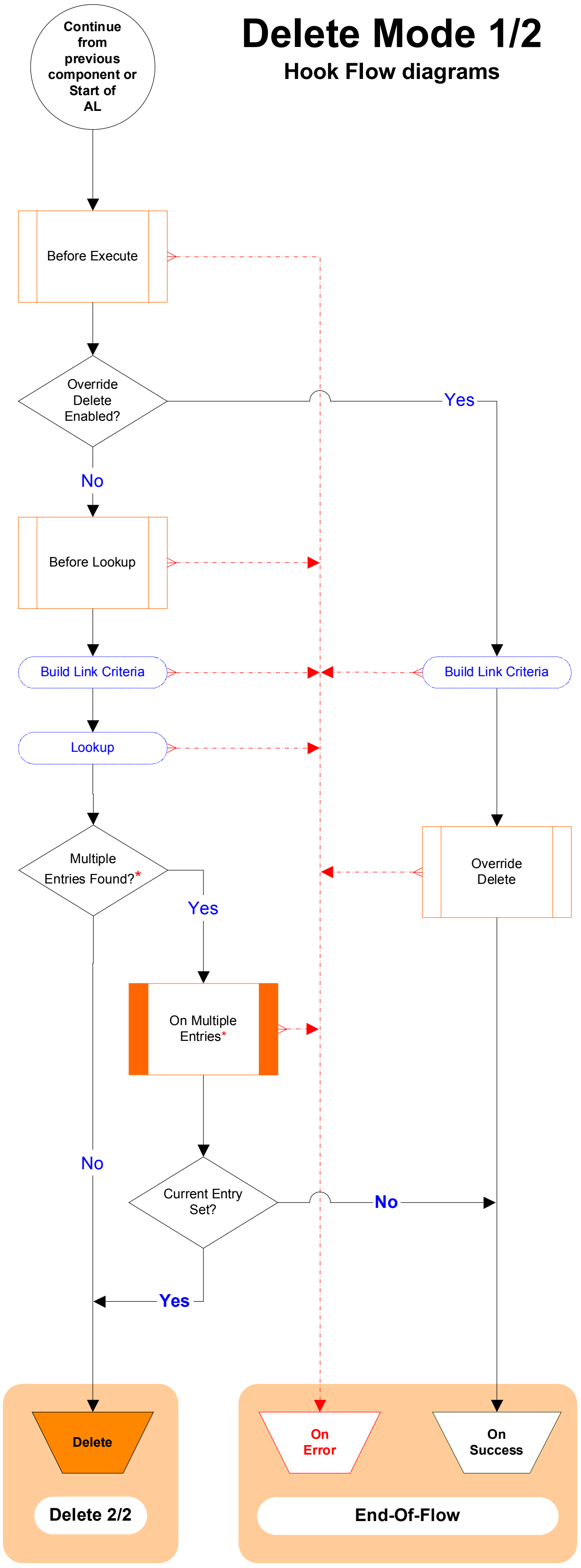
myConnector.setCurrent(*myEntry*)

If you do not set a current Entry, then execution will continue to On Success, bypassing the rest of the mode-specific flow.

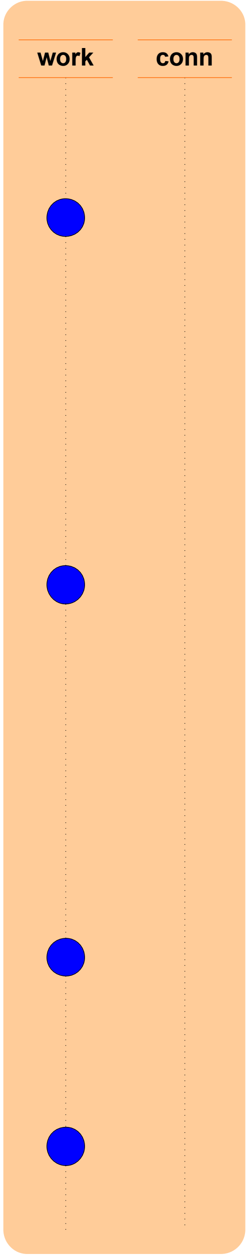
Note:

Data sources behave differently when multiple Entries are to be handled.

Even if you select a specific Entry as described above, it is not recommended that you continue with the delete flow, as this may result in an error, or that the operation is performed on multiple entries.



Available temporary script variables



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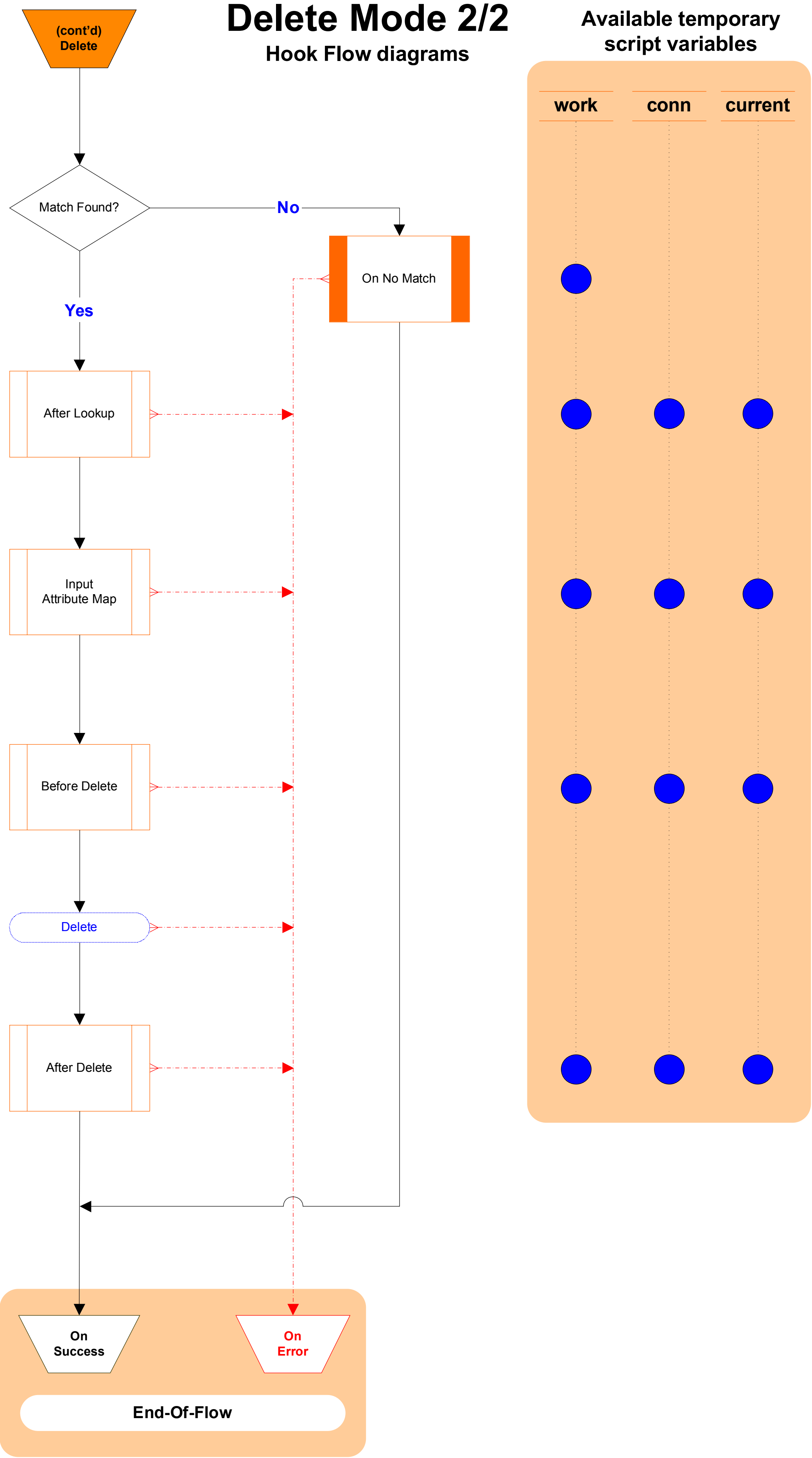
Directory Integrator

Delete Mode 2/2

Hook Flow diagrams



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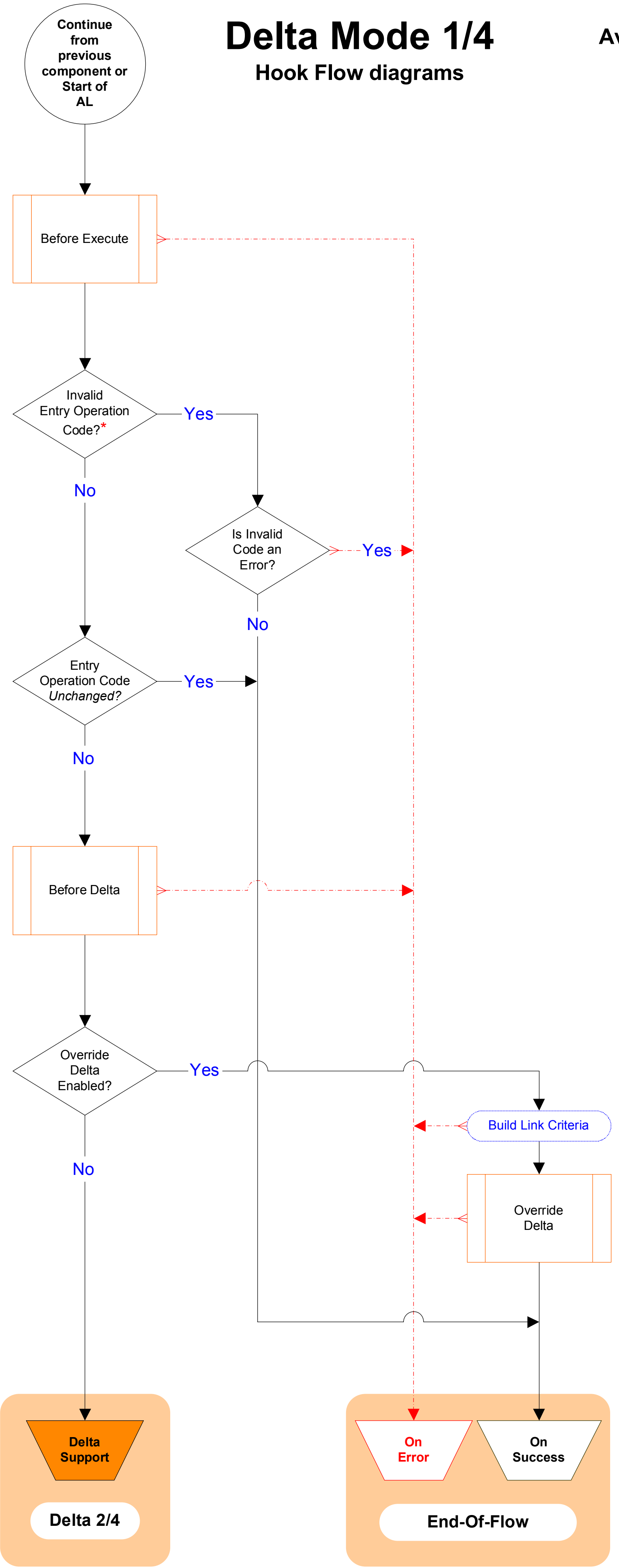
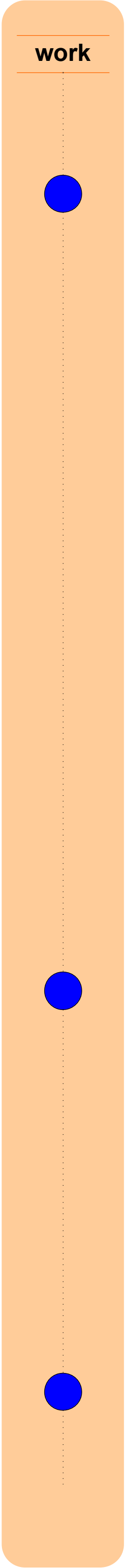
Delta Mode 1/4

Hook Flow diagrams



Available temporary script variables



Available Objects

As always, **work** gives you access to the attributes that are currently in the AssemblyLine.

After the **Build Link Criteria** operation, there is a script object called **search** available which gives you access to this information (e.g. for use in the Override Hook).

*Valid Operation Code

Be default, an **exception** is thrown if Delta mode detects that the work Entry does not have a valid **operation code** (for example, "**generic**"). Operation code detection occurs after the **Before Execute** Hook. Delta mode can be configured to *ignore* these Entries instead.

Delta Application

During Delta processing, the necessary steps are taken to prepare for for applying the detected changes as efficiently as possible.

For example, **multi-value Attributes** require special handling so that **value-level Delta operation codes** are applied correctly.

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Delta Mode 2/4

Hook Flow diagrams

Available temporary script variables

#Incr. Mod. possible?

The Connector checks to see if the underlying system supports incremental modifications.

For the LDAP Connector, this will always be Yes.

For the JDBC Connector the answer is currently always be No.

*On Multiple Entries

If more than one record/entry is found that matches the Link Criteria then the On Multiple Entries Hook must also be **enabled**, or this is treated as an **error**.

You can access the set of records/entries found by using either of these two Connector functions:

getFirstDuplicateEntry()
or
getNextDuplicateEntry()

Each of these functions returns an **Entry** object that can be used to call a Connector Interface's data access methods (.update(), delete(), etc.).

In addition, **conn** may be set to the desired **Entry** object by calling the Connector's **setCurrent()** function:

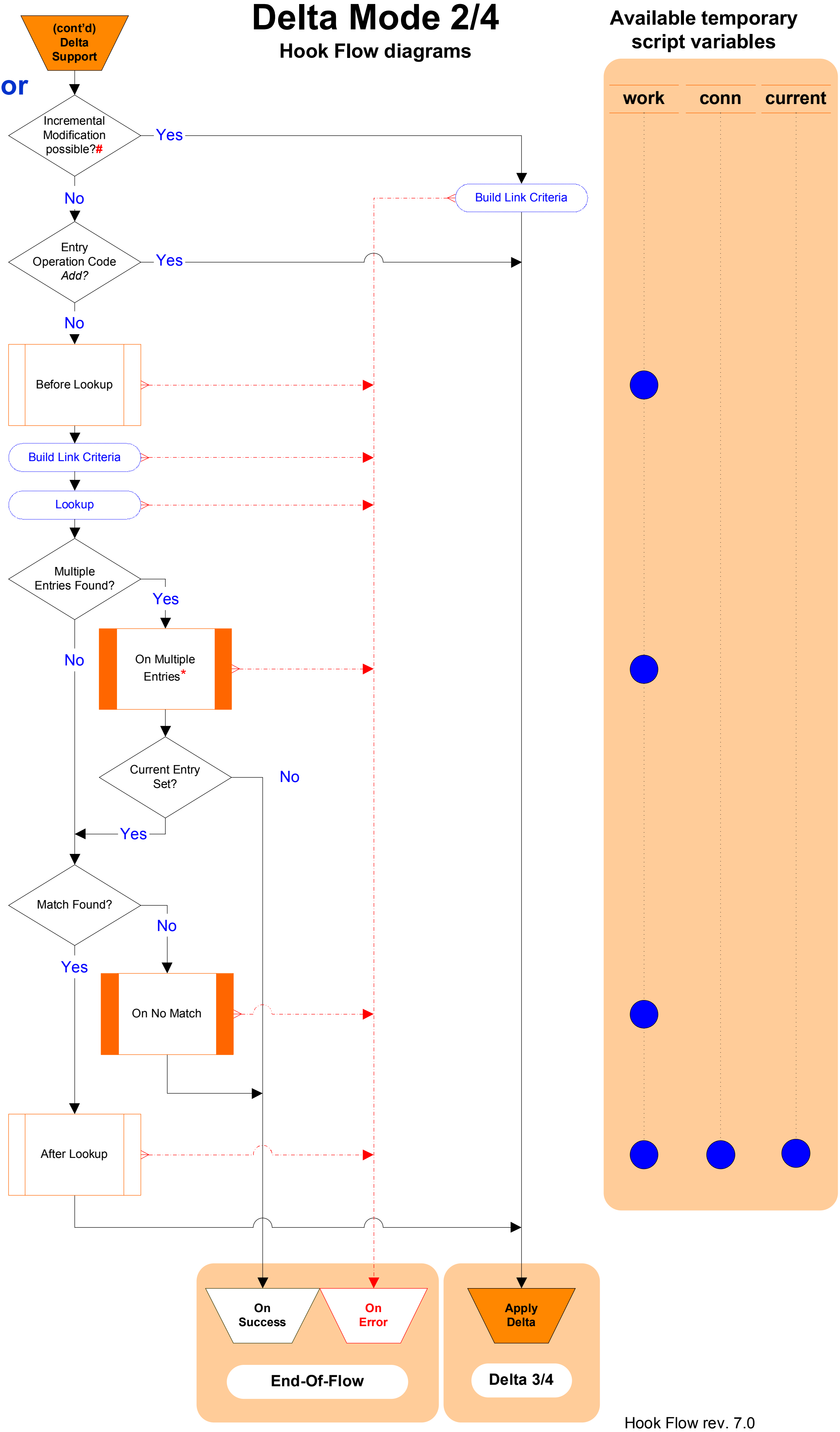
myConnector.setCurrent(*myEntry*)

If no Entry object is set, then execution will continue to **On Success**, skipping the rest of the mode-specific flow.

Note:

Please note that data sources (and therefore related Connectors) behave differently when multiple Entries are to be handled.

Even if you set a specific Entry as described above, it is not recommended that you continue with the delta operation, as this may result in an error, or that the operation is performed on multiple entries.



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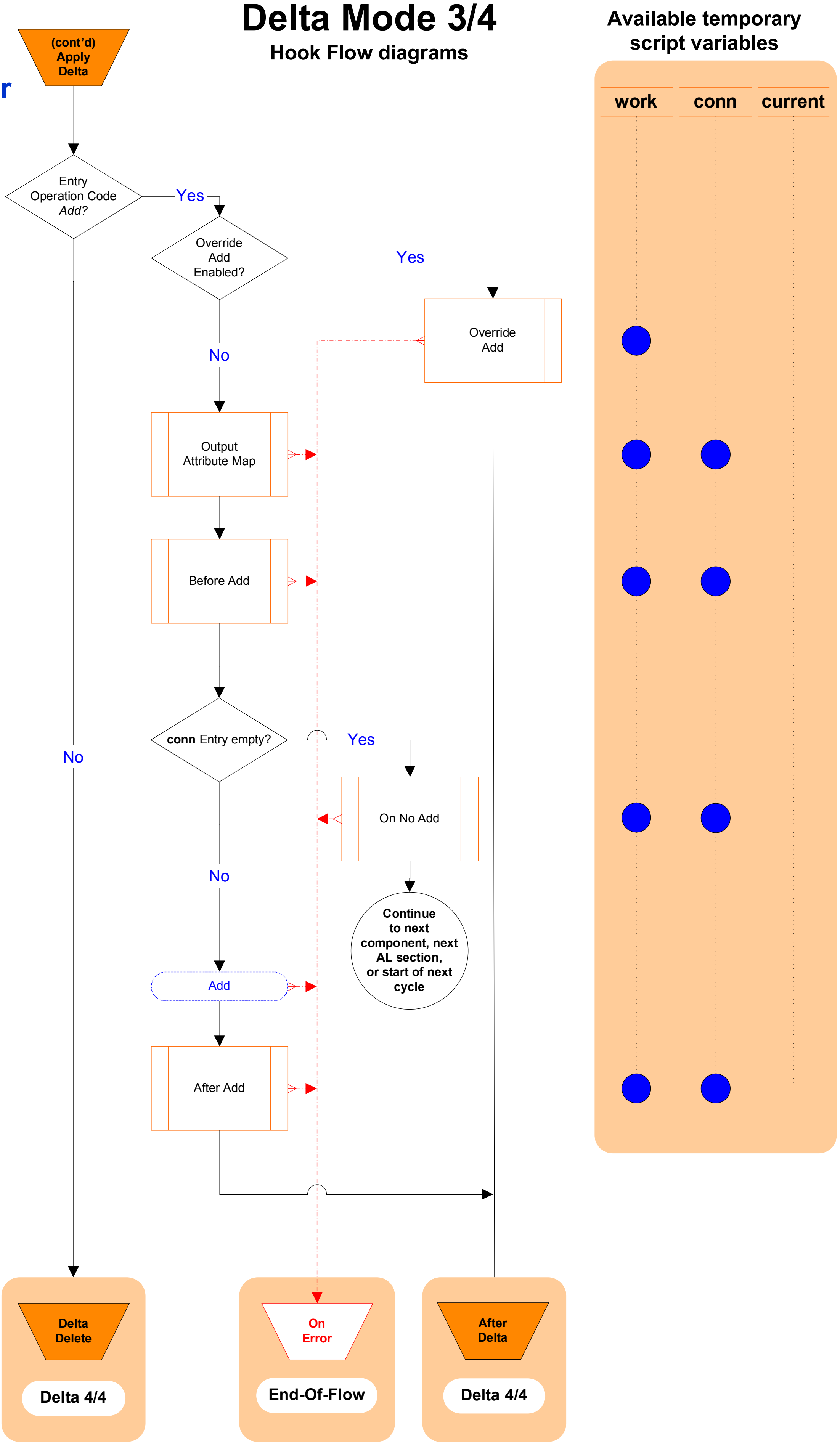
Delta Mode 3/4

Hook Flow diagrams



Available temporary script variables

work | conn | current

(cont'd) Apply Delta

Entry Operation Code *Add?*

Yes

Override Add Enabled?

Yes

Override Add

No

Output Attribute Map

Before Add

conn Entry empty?

Yes

On No Add

Continue to next component, next AL section, or start of next cycle

No

Add

After Add

No

Delta Delete

Delta 4/4

On Error

End-Of-Flow

After Delta

Delta 4/4

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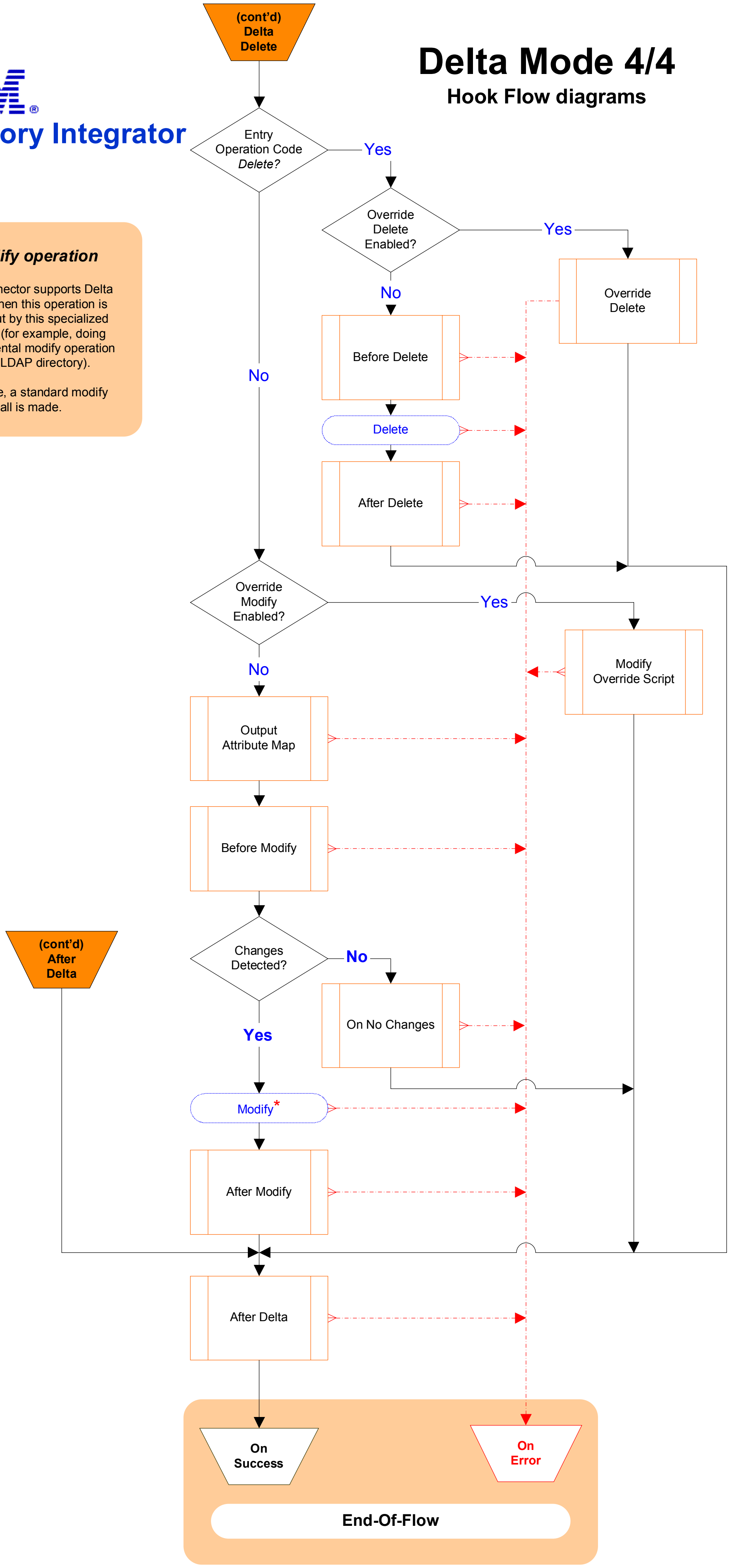
Delta Mode 4/4

Hook Flow diagrams

***Modify operation**

If the Connector supports Delta directly, then this operation is carried out by this specialized behavior (for example, doing an incremental modify operation for an LDAP directory).

Otherwise, a standard modify call is made.



Available temporary script variables

	work	conn	current
Override Delete	●		
Before Delete	●	●	●
After Delete	●	●	●
Modify Override Script	●	●	●
Output Attribute Map	●	●	●
Before Modify	●	●	●
On No Changes	●	●	●
After Modify	●	●	●
After Delta	●	●	○

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Iterator Mode

Hook Flow diagrams

Available Objects

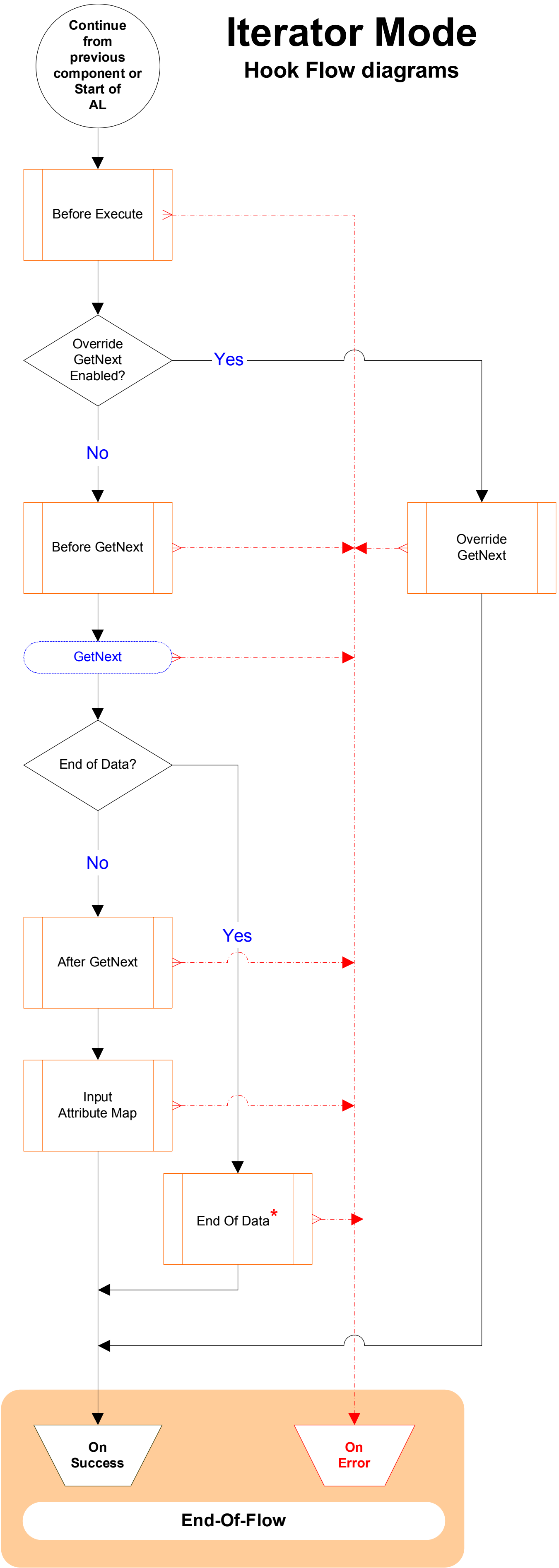
As always, **work** gives you access to the attributes that are currently in the AssemblyLine.

The data read in by each **GetNext** operation is available in the **conn** object.

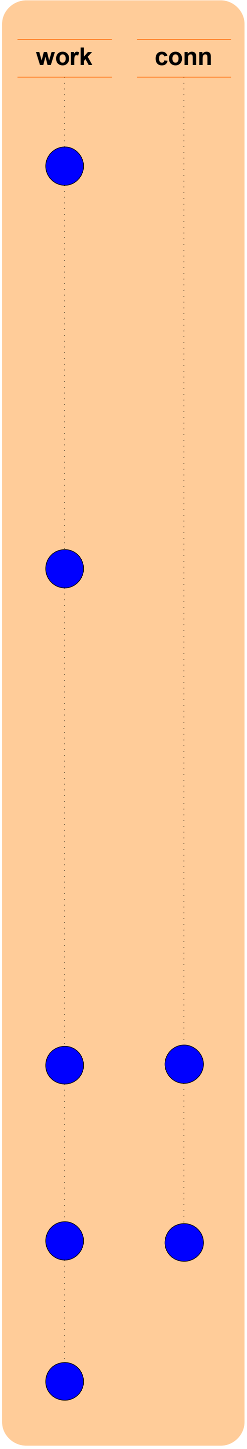
Note:

If a Connector in Iterator mode detects the presence of a valid **work** object at the start of its execution - *for example, that there is another Iterator in front of this one in the same AssemblyLine, or that the initial work Entry has been passed into the AssemblyLine from a calling process or system* - then this Connector will not be executed, passing instead this Entry to the next Connector in the AssemblyLine.

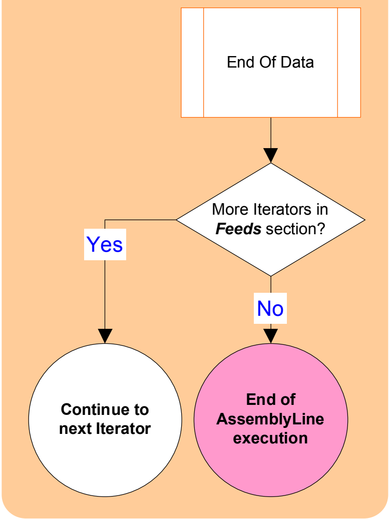
The sidebar below illustrates what happens when an Iterator reaches its end-of-data. At this point it will not pass a work object to the next Connector, which in the case of another Iterator, will signal it to begin its own iteration.



Available temporary script variables



*After the **End Of Data** hook, execution flow continues as shown below:



End Of Data
More Iterators in *Feeds* section?
Yes
No
Continue to next Iterator
End of AssemblyLine execution

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Directory Integrator

Lookup Mode

Hook Flow diagrams

Available Objects

As always, **work** gives you access to the attributes that are currently in the AssemblyLine.

After the **Build Link Criteria** operation, there is a script object called **search** available which gives you access to this information (i.e. for use in the Override Hook).

The record/entry matching the **Link Criteria** is available through the **conn** object.

**On Multiple Entries*

If more than one record/entry is found that matches the Link Criteria then the On Multiple Entries Hook must also be **enabled**, or this is treated as an **error**.

During this hook, **conn** may be set to the desired **Entry** object by calling the Connector's **setCurrent()** function:

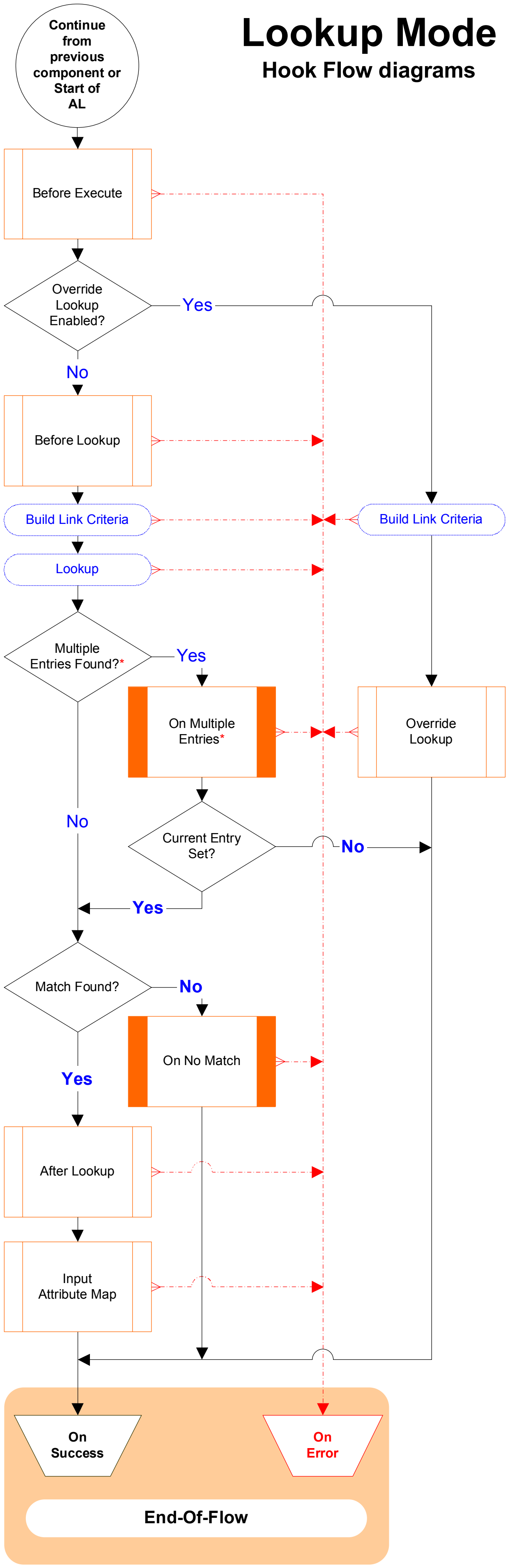
myConnector.setCurrent(*myEntry*)

You can access the set of records/entries found by using either of these two Connector functions:

getFirstDuplicateEntry()
or
getNextDuplicateEntry()

Each of these functions returns an **Entry** object that can be used in the setCurrent() call.

If setCurrent() is not called (e.g. no current entry is set) then the flow is passed on to **On Success**, skipping the rest of the mode-specific flow.



Continue from previous component or Start of AL

Before Execute

Override Lookup Enabled?

Yes

No

Before Lookup

Build Link Criteria

Build Link Criteria

Lookup

Multiple Entries Found?*

Yes

On Multiple Entries*

Override Lookup

No

Current Entry Set?

No

Yes

Match Found?

No

On No Match

Yes

After Lookup

Input Attribute Map

On Success

On Error

End-Of-Flow

Available temporary script variables

work	conn	current
●		
●		
●		
●		
●	●	●
●	●	●

Hook Flow rev. 7.0
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IBM Directory Integrator

Server Mode

Hook Flow diagrams

Available Objects

The only temporary Entry object is **conn**, which is available in the **After Accepting Connection** Hook.

This Entry contains a single Attribute called

connectorInterface

Its only value is a reference to the Connector Interface that will be paired up with the ***Flow*** component list in in **Iterator Mode** to feed it with event data.

Server Behavior

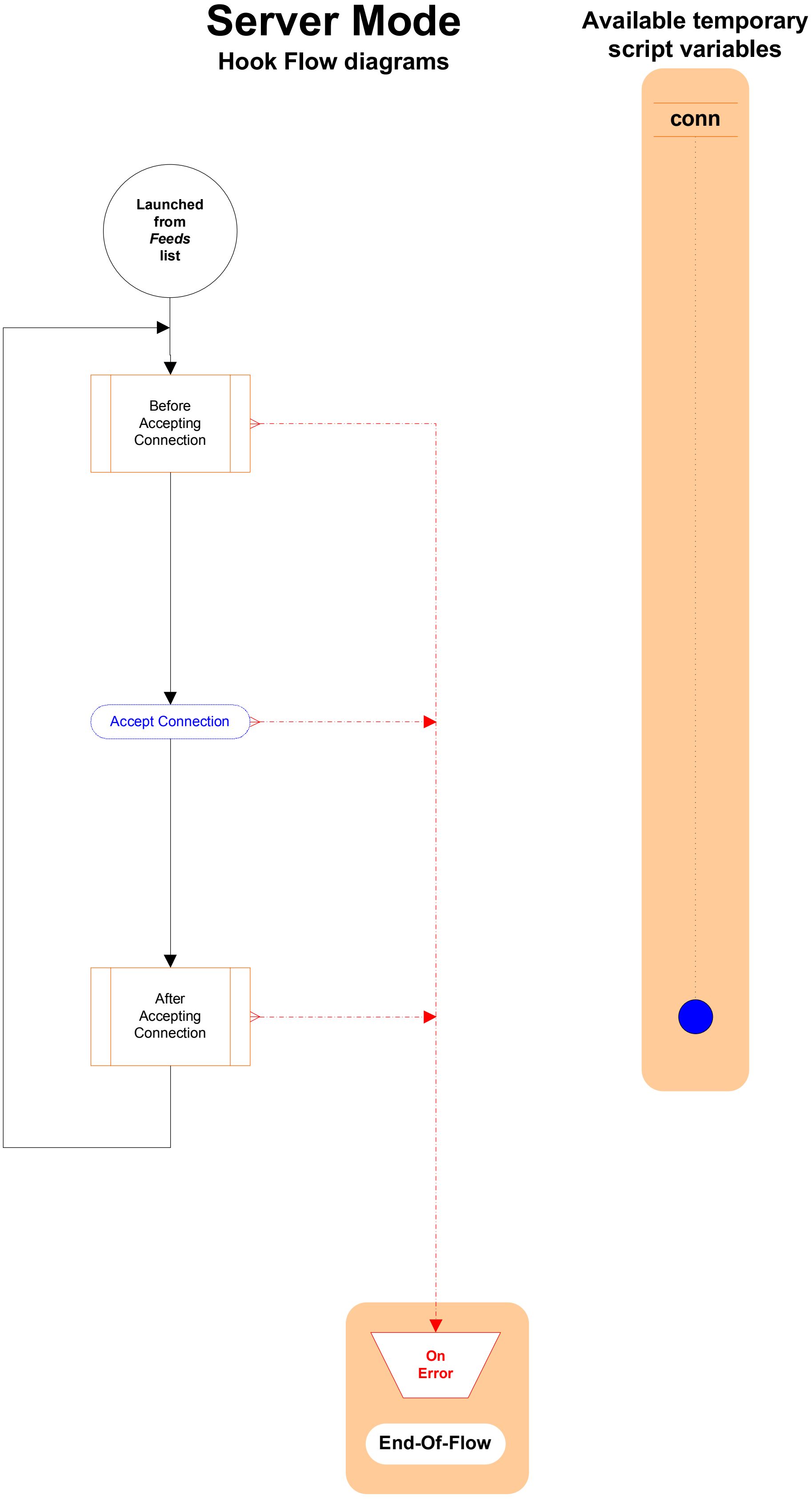
Server Mode Connectors do ***not*** run exclusively like Iterators do. Instead, each is launched as a separate process in ***event listening*** mode and control is passed to the next ***Feeds*** Connector.

When an event is detected (for example, a client attempts to connect) then the Connector creates a ***clone*** of itself in **Iterator** Mode once the **After Accepting Connection** Hook has completed.

This cloned Iterator is then paired up with the AssemblyLine ***Flow*** component list (possibly from the **AL Pool**) and Hook flow continues as with standard **Iterator** mode.

Furthermore, once the ***Flow*** section of the AssemblyLine completes, control is passed to the **Server Response** logic which then creates and sends the required reply to the caller/client system.

The Response Hook flow is detailed on the page entitled **Server Response**.



Available temporary script variables

conn

Launched from *Feeds* list

Before Accepting Connection

Accept Connection

After Accepting Connection

On Error

End-Of-Flow

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Directory Integrator

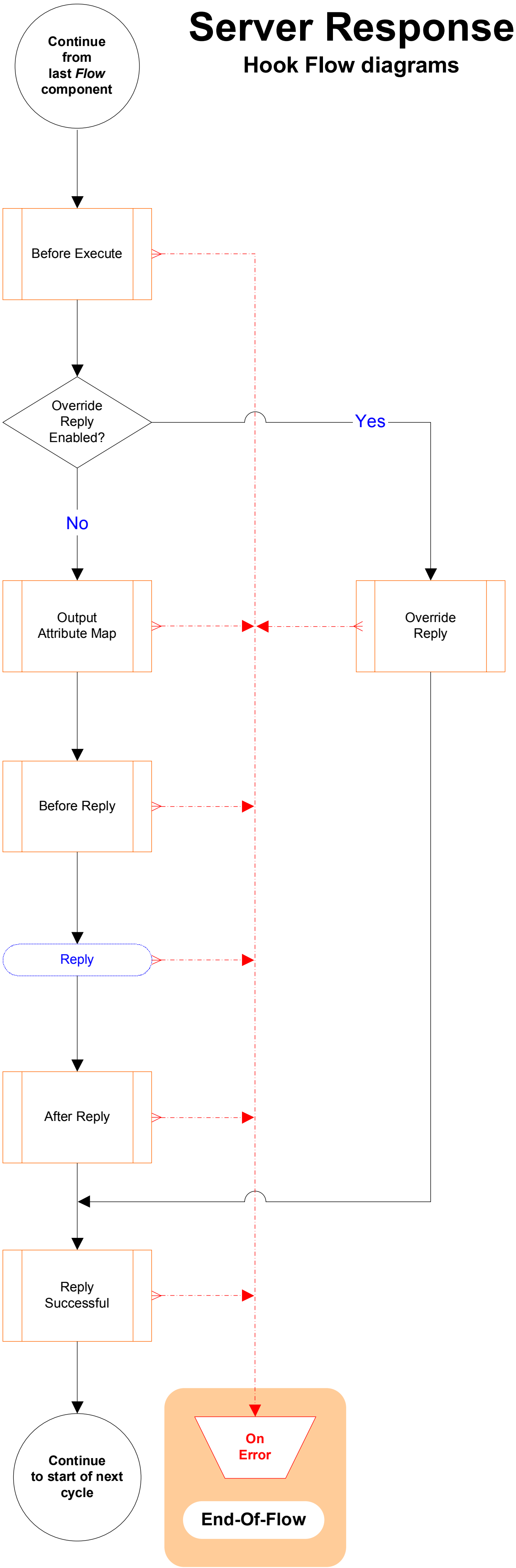
Server Response

Hook Flow diagrams

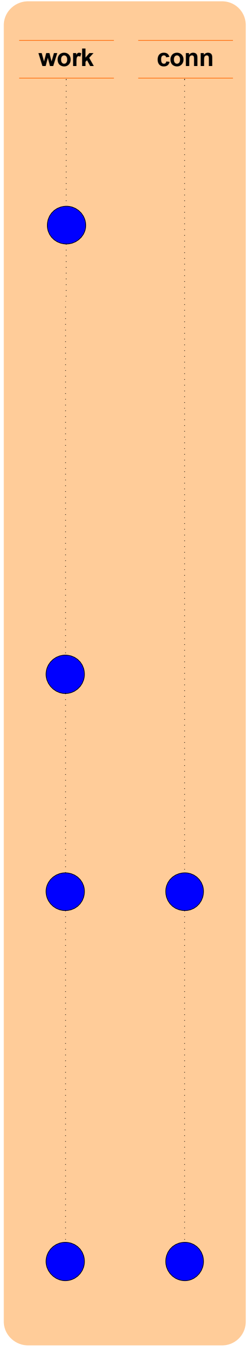
Available Objects

As always, **work** gives you access to the attributes that are currently in the AssemblyLine.

The information stored in the **conn** object is sent to the data source by the **Reply** operation.



Available temporary script variables



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IBM
Directory Integrator

Update Mode 1/3

Hook Flow diagrams

Available Objects

As always, **work** gives you access to the attributes that are currently in the AssemblyLine.

After the **Build Link Criteria** operation, there is a script object called **search** available which gives you access to this information (e.g. for use in the Override Hook).

******On Multiple Entries*

If more than one record/entry is found that matches the Link Criteria then the On Multiple Entries Hook must also be **enabled**, or this is treated as an **error**.

You can access the set of records/entries found by using either of these two Connector functions:

getFirstDuplicateEntry()
or
getNextDuplicateEntry()

Each of these functions returns an **Entry** object that can be used to call a Connector's data access methods (.update(), delete(), etc.).

In addition, **conn** may be set to the desired **Entry** object by calling the Connector's **setCurrent()** function:

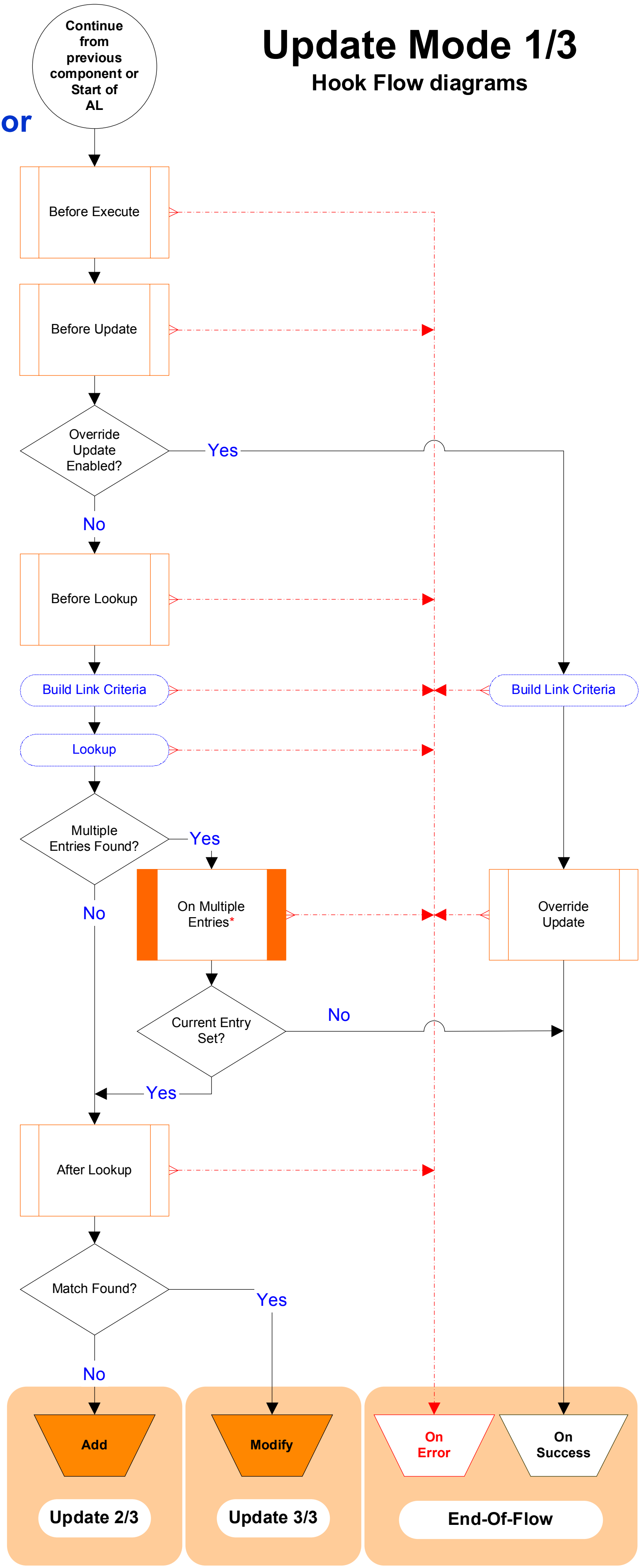
myConnector.setCurrent(*myEntry*)

If no Entry object is set, then execution will continue to **On Success**, skipping the rest of the mode-specific flow.

Note:

Please note that data sources (and therefore related Connectors) behave differently when multiple Entries are to be handled.

Even if you set a specific Entry as described above, it is not recommended that you continue with the update operation, as this may result in an error, or that the operation is performed on multiple entries.



Continue from previous component or Start of AL

Before Execute

Before Update

Override Update Enabled?

Yes

No

Before Lookup

Build Link Criteria

Build Link Criteria

Lookup

Multiple Entries Found?

Yes

No

On Multiple Entries*

Override Update

Current Entry Set?

No

Yes

After Lookup

Match Found?

Yes

No

Add

Modify

On Error

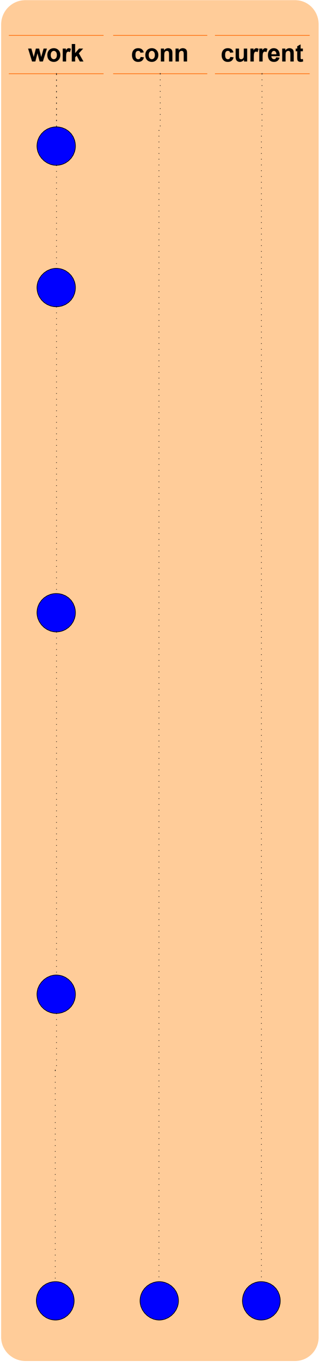
On Success

Update 2/3

Update 3/3

End-Of-Flow

Available temporary script variables



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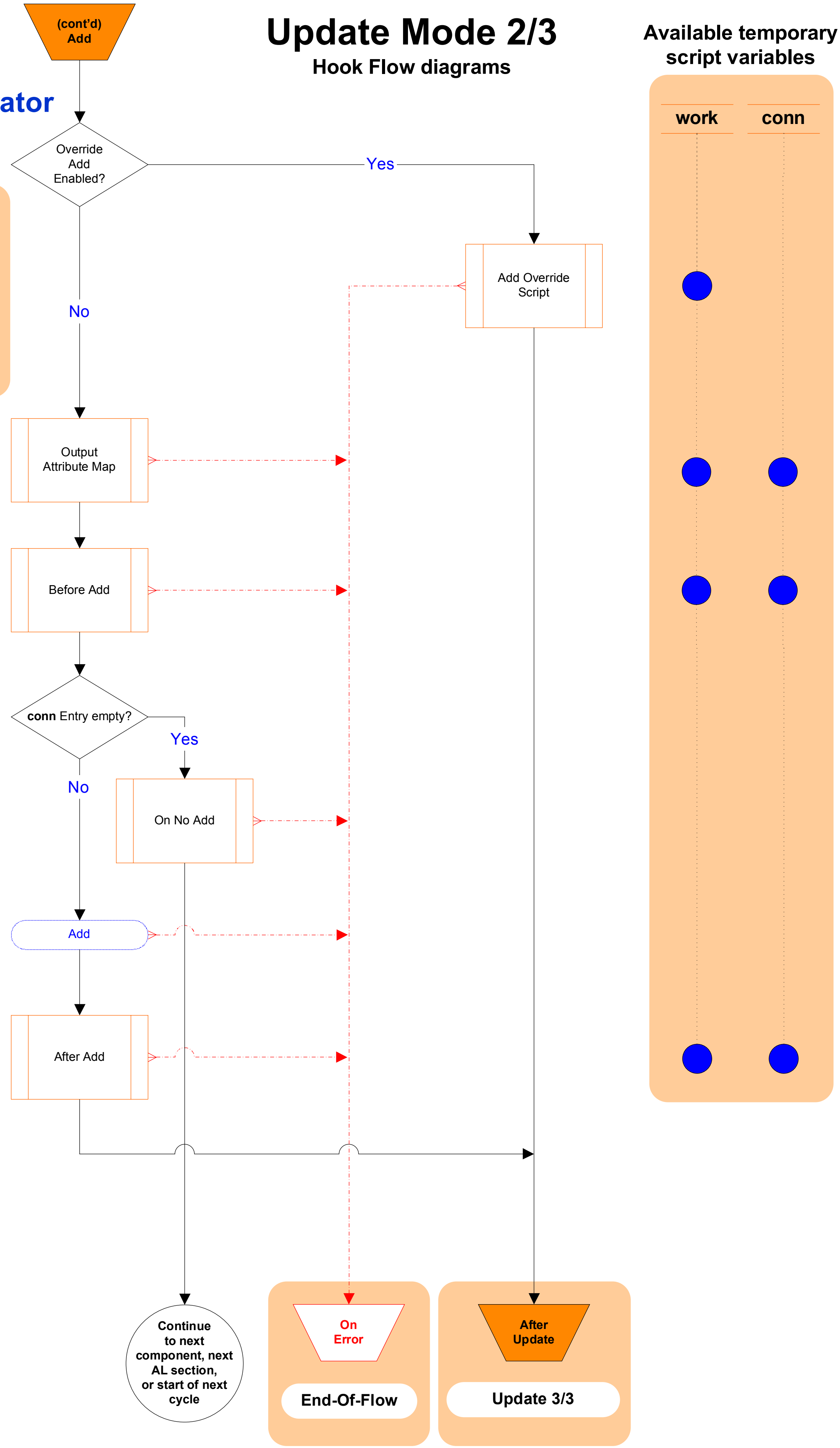
Update Mode 2/3

Hook Flow diagrams

Available Objects

As always, **work** gives you access to the attributes that are currently in the AssemblyLine.

If the Update results in an **Add** operation, **conn** holds the data that is written to the data source.



(cont'd) Add

Override Add Enabled?

Yes

No

Add Override Script

Output Attribute Map

Before Add

conn Entry empty?

Yes

No

On No Add

Add

After Add

Continue to next component, next AL section, or start of next cycle

On Error

End-Of-Flow

After Update

Update 3/3

Available temporary script variables

work

conn

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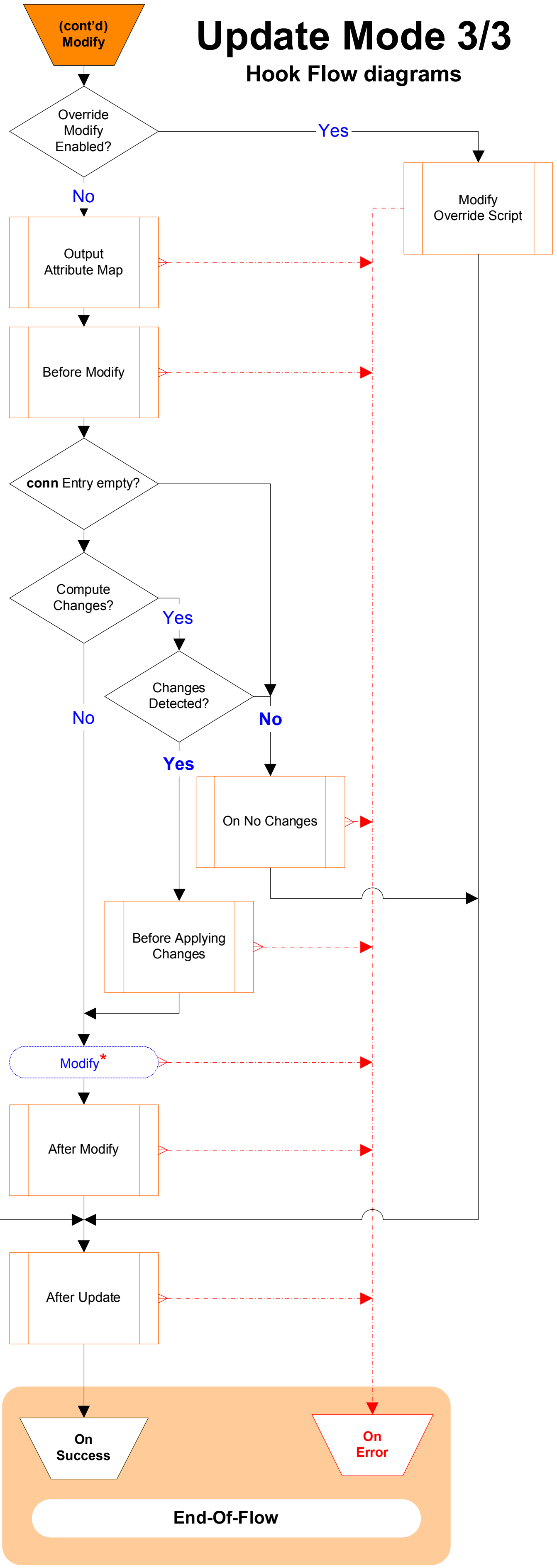
Update Mode 3/3

Hook Flow diagrams



Available Objects

As always, **work** gives you access to the attributes that are currently in the AssemblyLine.

If the update results in a **Modify** operation, the **current** object gives you access to the record/entry in the connected data source that matched the Link Criteria (e.g. is about to be modified). Note that until the Output Map, both conn and current contain the same information.

As in the case of an **Add**, the **conn** object holds the information that is to be written to the data source, in this case, by the **Modify** operation.

The *conn* object

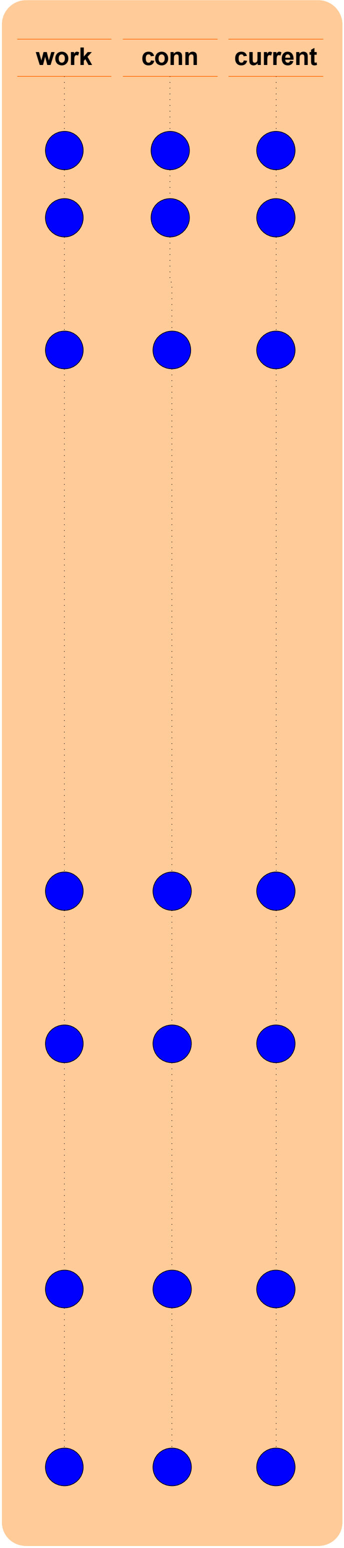
The conn object is emptied immediately before the **Output Map**. After this point, **conn** and **current** no longer contain the Entry object found by the lookup operation.

****Modify***

Please note that some data sources will compute changes automatically, and if none are detected, will revert with a **No Changes** exception. This will cause flow to be directed to the **On No Changes** Hook.

(cont'd) After Update

Available temporary script variables



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End-Of-Flow for All Connector Modes

Hook Flow diagrams

Available Objects

As always, **work** gives you access to the attributes that are currently in the AssemblyLine,.

The **conn** and **curent** objects are available in the **On Error** and **On Success** Hooks if they were present previously in the flow

End-Of-Flow

This flow applies to all components that either terminate normally (e.g. successfully) or due to an error.

Error Handling

Please note that if either **On Error** Hook is enabled, then control is passed to the next component, as if the Connector had terminated successfully; Otherwise, the AssemblyLine **aborts**.

The error condition can be passed on to next On Error Hook (either the Default for the Connector, or the AssemblyLine Error Hook) by re-throwing the exception:

throw error.getObject("exception");

Furthermore, if an error occurs in an **On Error** Hook, then the AssemblyLine will also **abort**.

The **error** object (of type **Entry**) is available throughout an AssemblyLine, and provides information about the error situation through its attributes: **status**, **exception**, **class**, **message**, **operation** and **connectorname**.

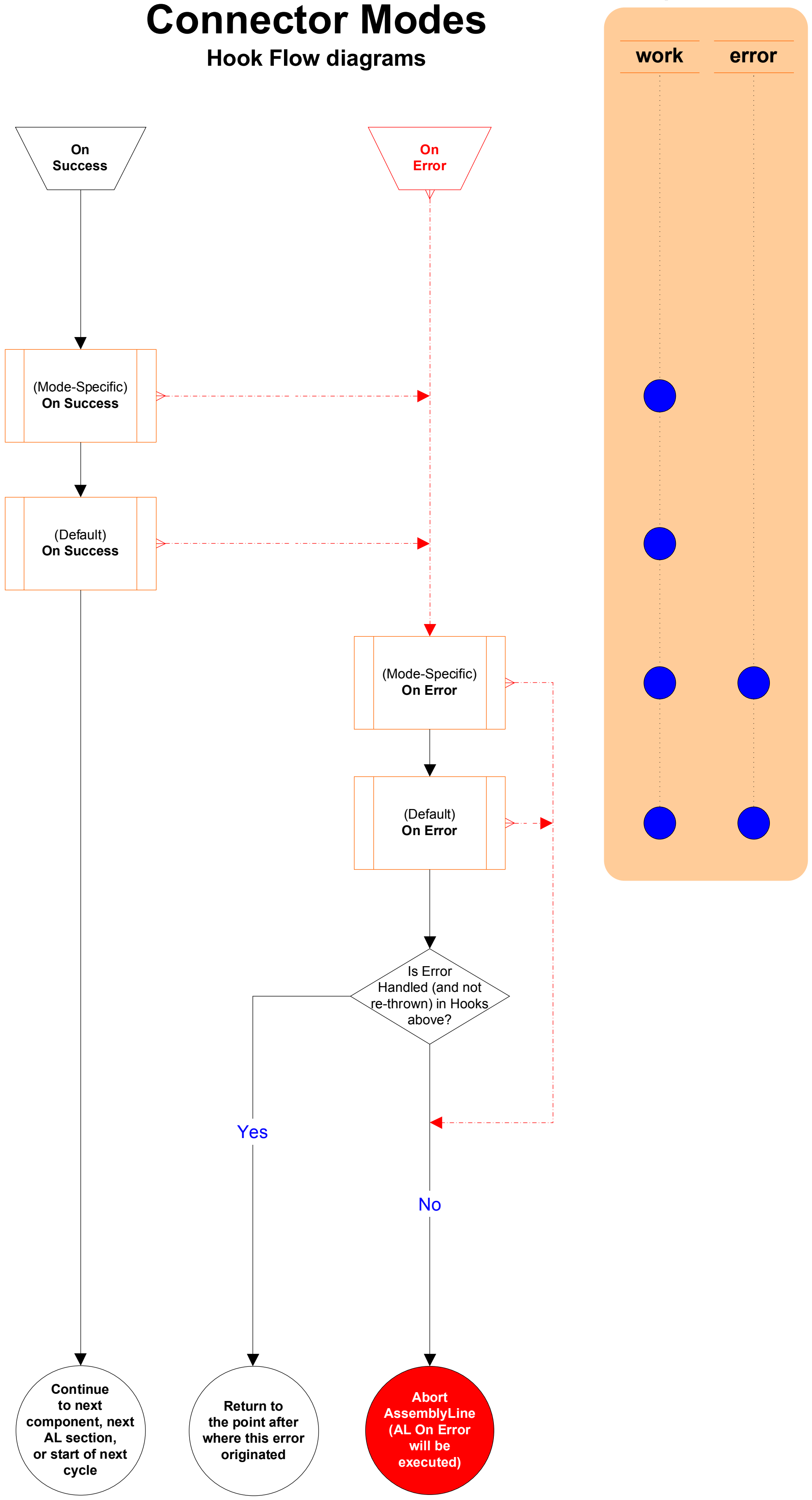
The **status** attribute will have the string value "**OK**" until an error situation arises, at which time it is assigned the value "**fail**" and the other attributes are added to **error**.

AssemblyLine End-of-Flow

If the AssemblyLine completes without unhandled errors, the AssemblyLine **On Success** Hook is invoked.

Otherwise, if an error has occurred than control is passed to the AssemblyLine **On Error** Hook.

Available temporary script variables



work
error

On Success

On Error

(Mode-Specific)
On Success

(Default)
On Success

(Mode-Specific)
On Error

(Default)
On Error

Is Error Handled (and not re-thrown) in Hooks above?

Yes

No

Continue to next component, next AL section, or start of next cycle

Return to the point after where this error originated

Abort AssemblyLine (AL On Error will be executed)

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Connector Reconnect

Hook Flow diagrams

Available Objects

As always, **work** gives you access to the attributes that are currently in the AssemblyLine,.

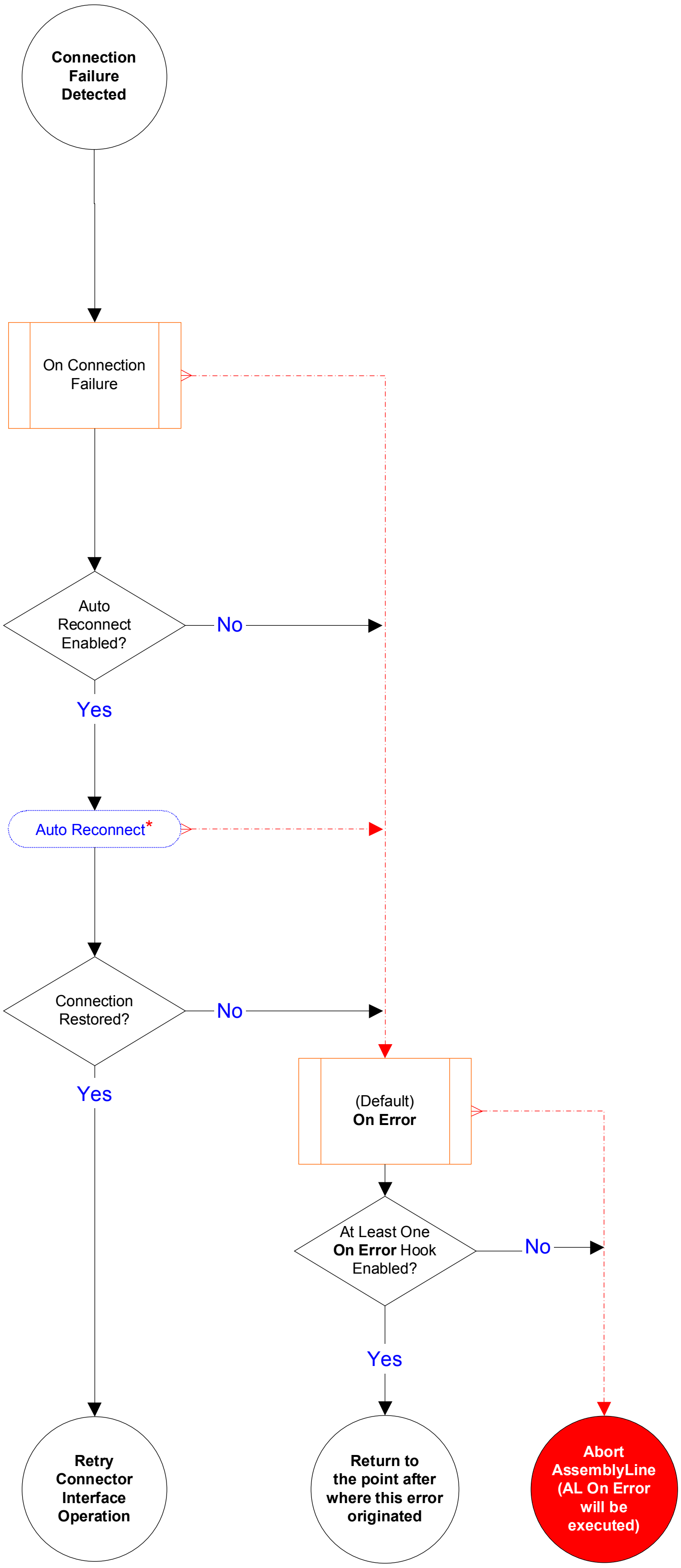
The **error** object (of type **Entry**) is available throughout an AssemblyLine, and provides information about the an error situation through its attributes: ***status***, ***exception***, ***class***, ***message***, ***operation*** and ***connectorname***.

The **status** attribute will have the string value "**OK**" until an error situation arises, at which time it is assigned the value "**fail**" and the other attributes are added to **error**.

**Auto Reconnect*

The Auto Reconnect feature is configured through the parameters found in the Connector **Reconnect** tab.

These parameters control the maximum number of times a reconnect will be tried, as well as the number seconds to wait between each attempt.



Connection Failure Detected
On Connection Failure
Auto Reconnect Enabled?
No
Yes
Auto Reconnect*
Connection Restored?
No
Yes
(Default) On Error
At Least One On Error Hook Enabled?
No
Yes
Retry Connector Interface Operation
Return to the point after where this error originated
Abort AssemblyLine (AL On Error will be executed)

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Function (FC)

Available Objects

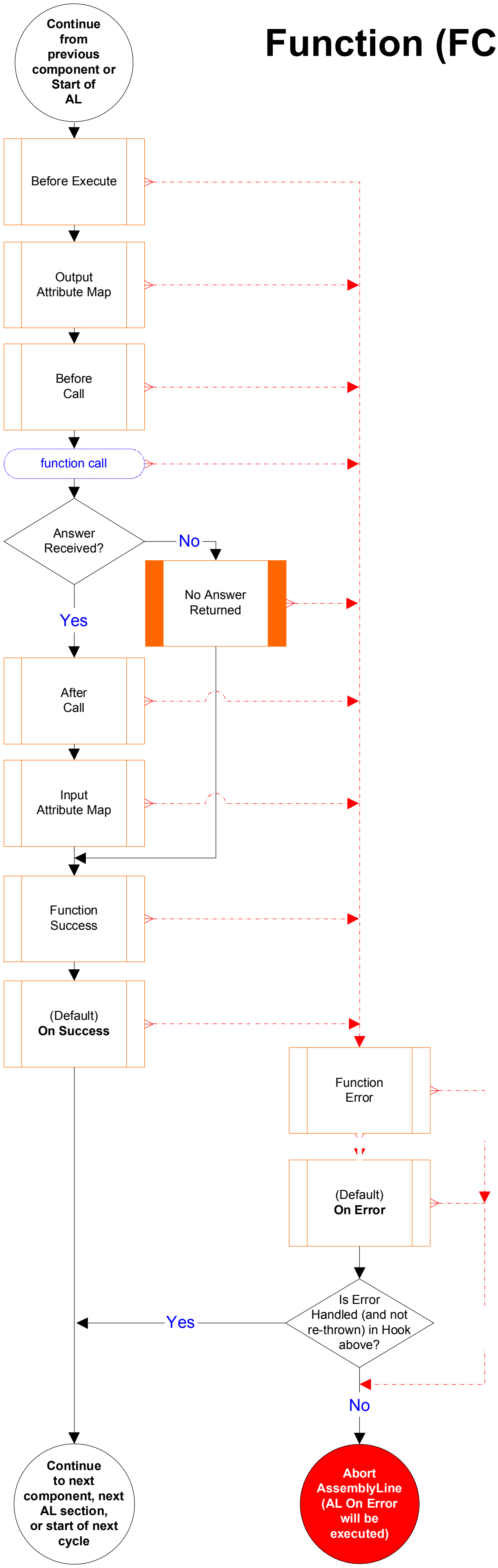
As always, **work** gives you access to the attributes that are currently in the AssemblyLine.

*The information stored in the **conn** object changes during FC operation.

It is important to note that the **conn** object serves two different purposes in a **Function**:

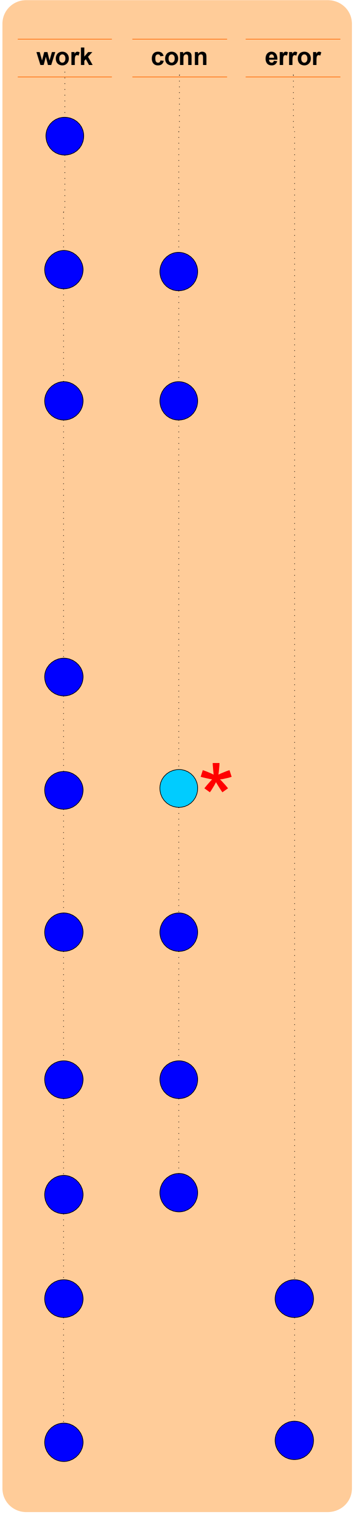
1) Storing the call attributes/parameters defined in the **Output Attribute Map** to be transmitted by the Function call operation,

2) Receiving return attributes/parameters that will be mapped in by the **Input Attribute Map** after the Function call operation



Continue from previous component or Start of AL
Before Execute
Output Attribute Map
Before Call
function call
Answer Received?
No
No Answer Returned
Yes
After Call
Input Attribute Map
Function Success
(Default) On Success
Function Error
(Default) On Error
Is Error Handled (and not re-thrown) in Hook above?
Yes
No
Continue to next component, next AL section, or start of next cycle
Abort AssemblyLine (AL On Error will be executed)

Available temporary script variables



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